



US009236200B2

(12) **United States Patent**
Cho

(10) **Patent No.:** **US 9,236,200 B2**
(45) **Date of Patent:** **Jan. 12, 2016**

(54) **TOUCH WINDOW AND MANUFACTURING METHOD THEREOF**

USPC 345/173-178; 178/18.01-18.09,
178/20.01-20.04

See application file for complete search history.

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 295 days.

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(21) Appl. No.: **13/906,896**

(22) Filed: **May 31, 2013**

Primary Examiner — Vijay Shankar

(65) **Prior Publication Data**

US 2013/0319835 A1 Dec. 5, 2013

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(30) **Foreign Application Priority Data**

May 31, 2012 (KR) 10-2012-0058540

(57) **ABSTRACT**

(51) **Int. Cl.**
G06F 3/041 (2006.01)
H01H 1/64 (2006.01)

Disclosed is a touch window. The touch window includes a cover window including an active area and an unactive area; a sensing electrode part on the active area; a wiring electrode part formed on the unactive area and connected to the sensing electrode part; an insulation film on one end of the wiring electrode part; a flexible printed circuit board spaced apart from the insulation film and formed on an opposite end of the wiring electrode part; and a protective layer on the wiring electrode part placed on a space region between the insulation film and the flexible printed circuit board.

(52) **U.S. Cl.**
CPC **H01H 1/64** (2013.01); **G06F 3/041** (2013.01); **G06F 2203/04103** (2013.01)

(58) **Field of Classification Search**
CPC G06F 3/041; G06F 3/044; G06F 2203/04102; G06F 2203/04103

18 Claims, 9 Drawing Sheets

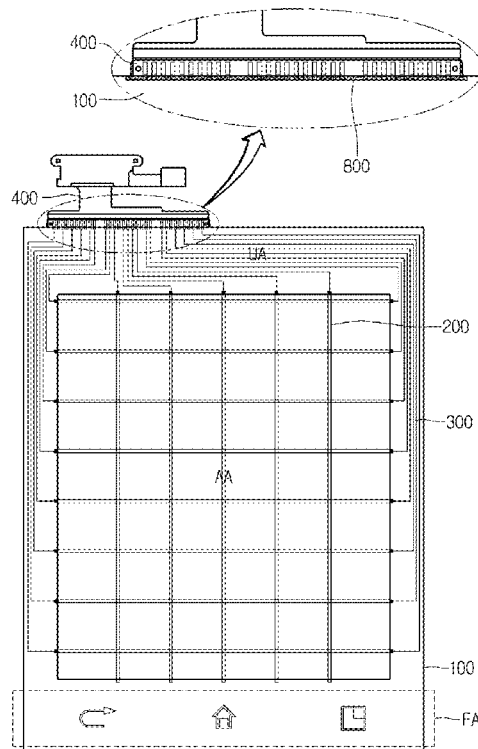


FIG. 1

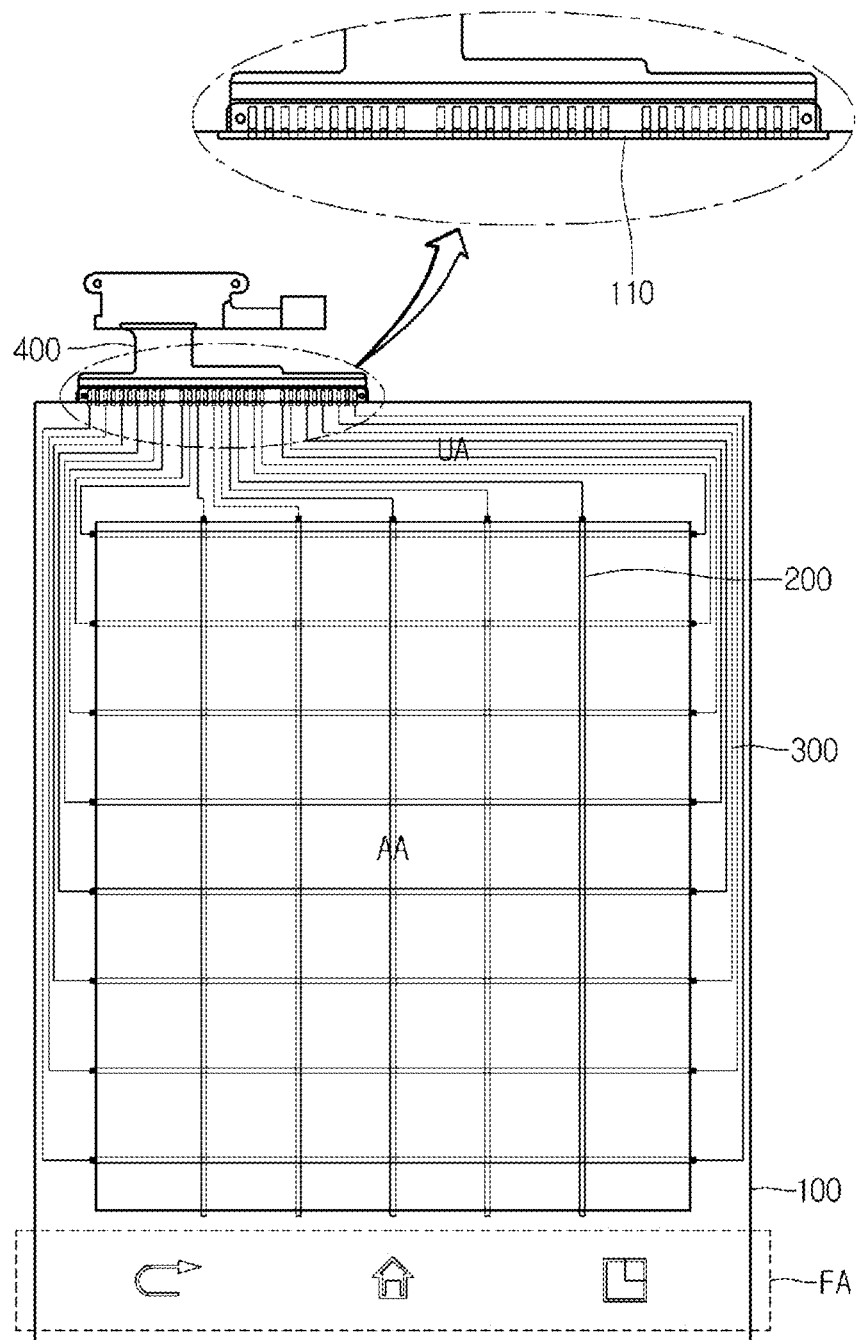


FIG. 2

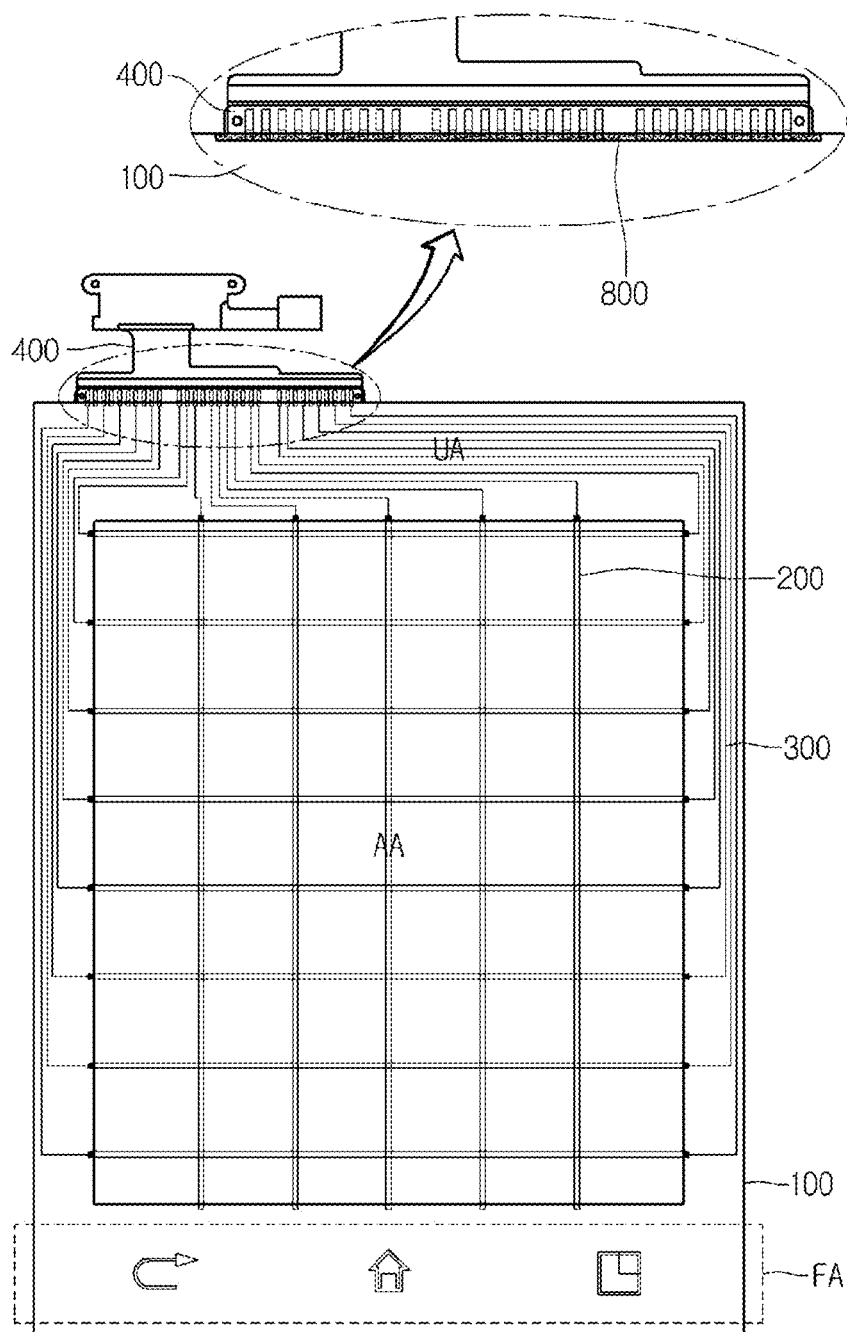


FIG. 3

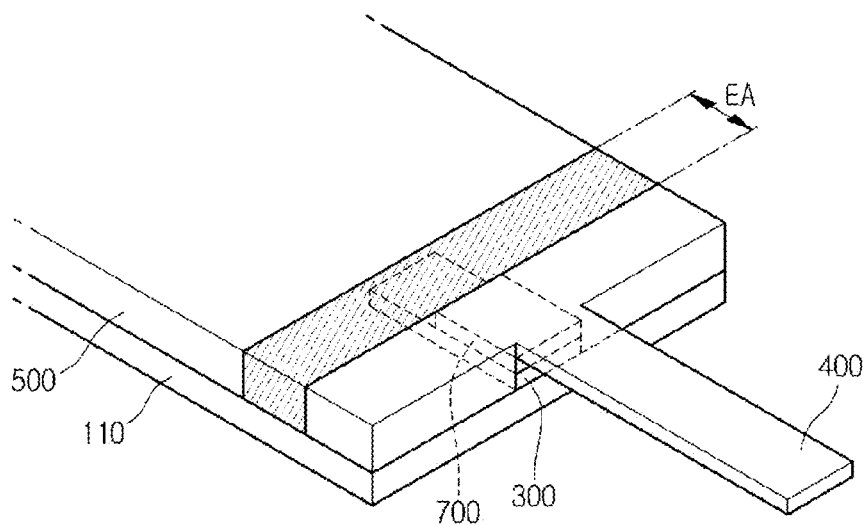


FIG. 4

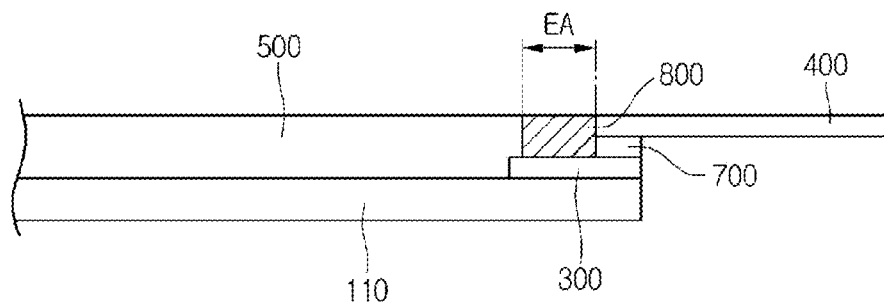


FIG. 5

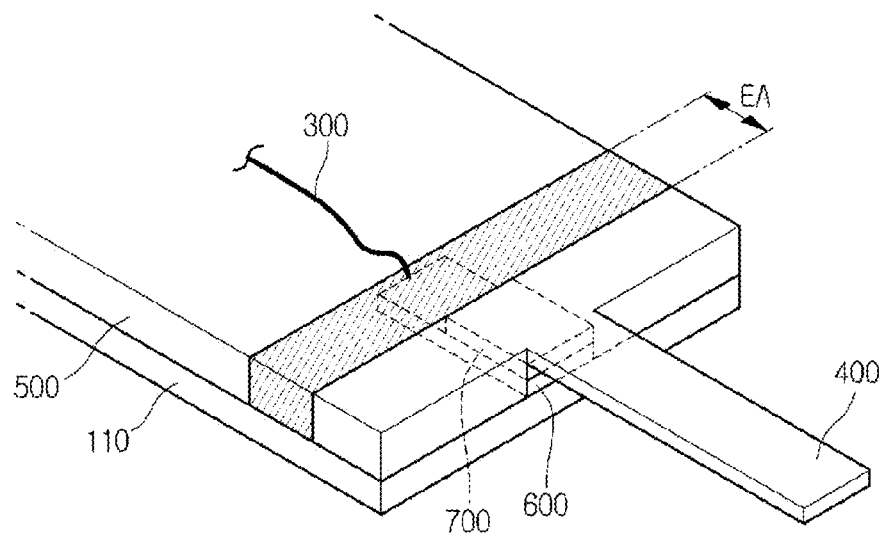


FIG. 6

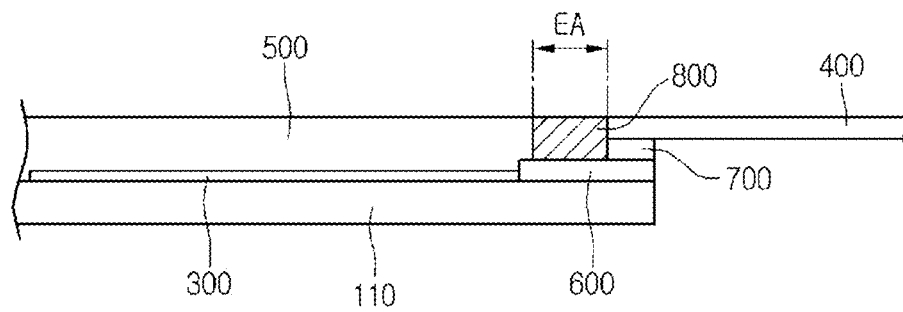


FIG. 7

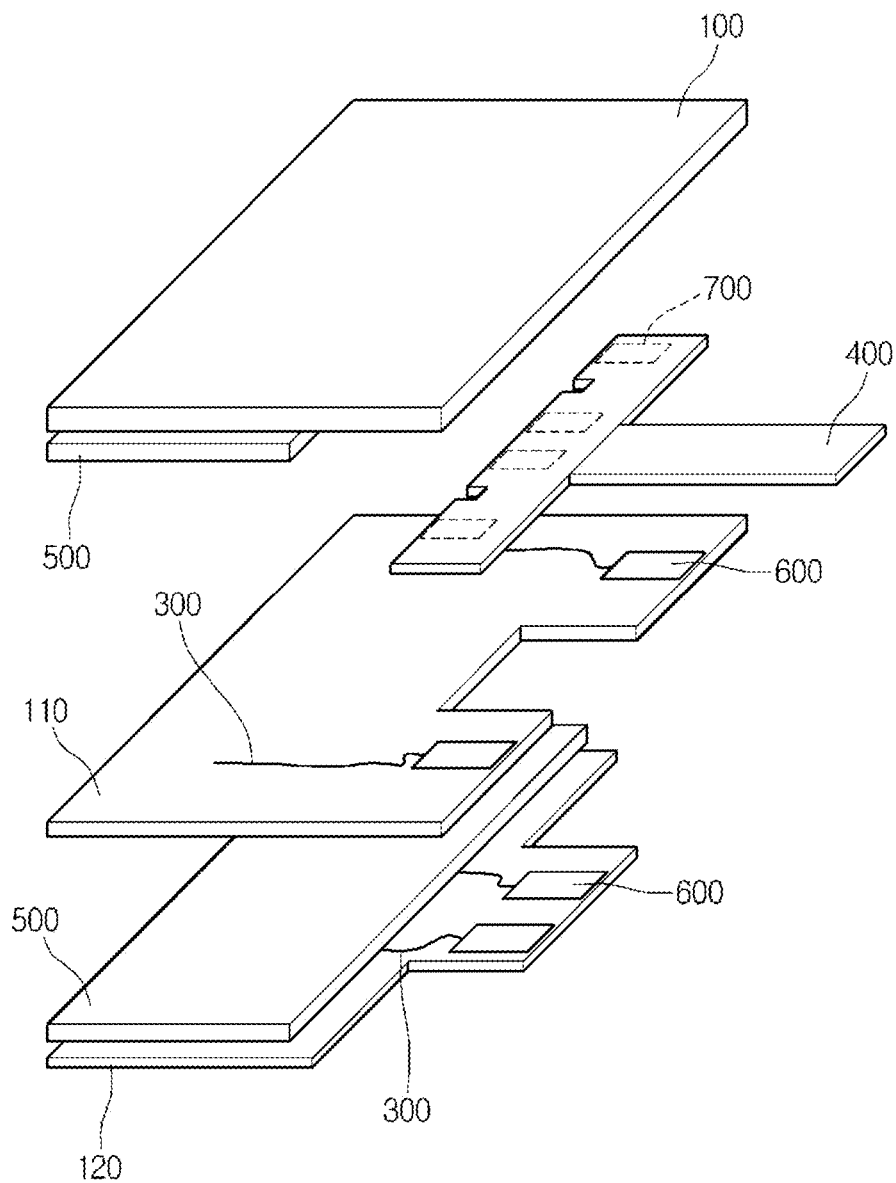


FIG. 8

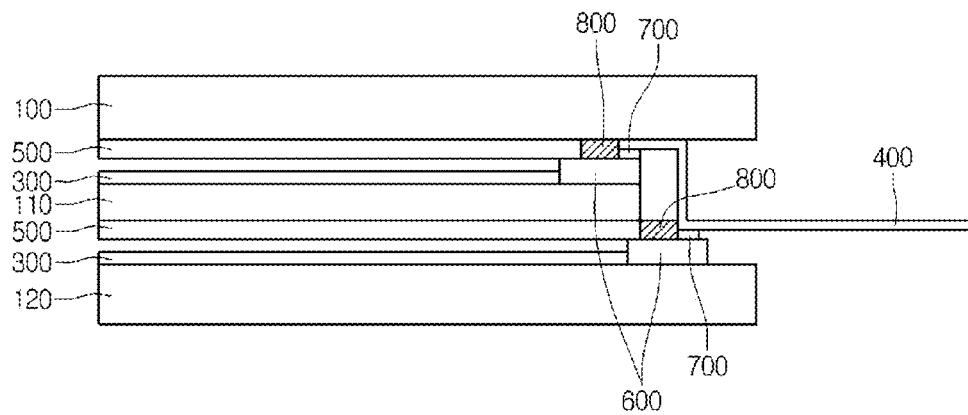


FIG. 9

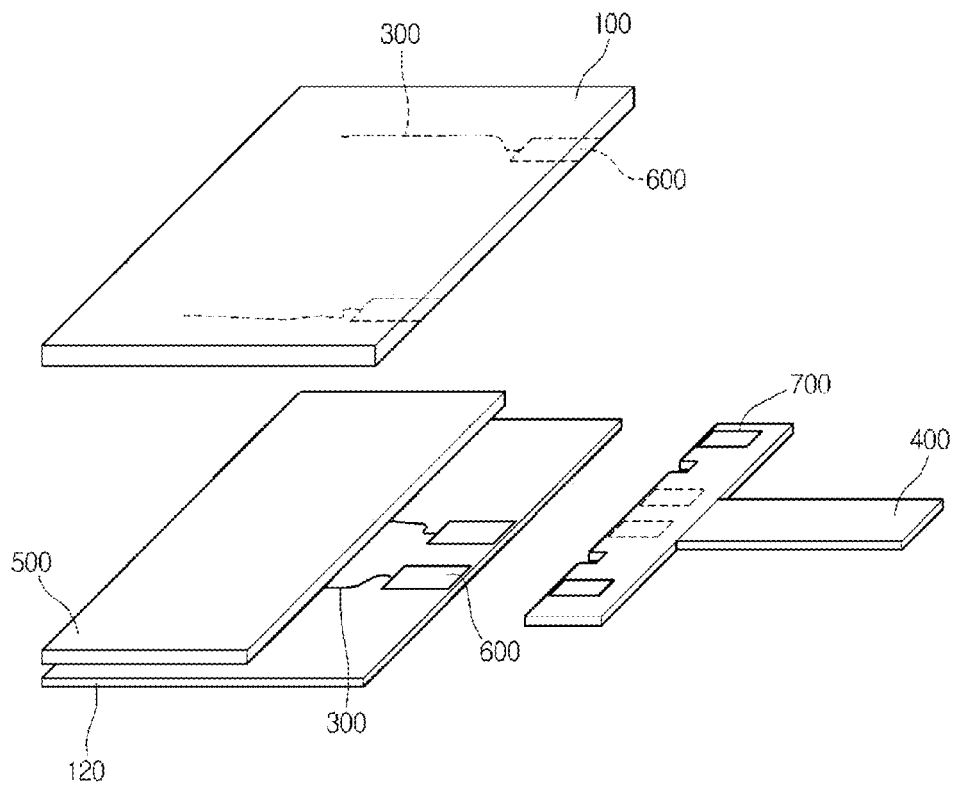


FIG. 10

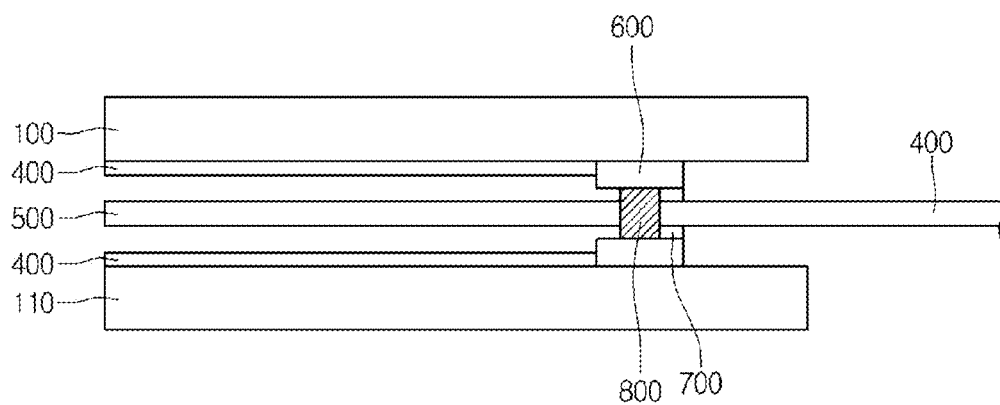


FIG. 11

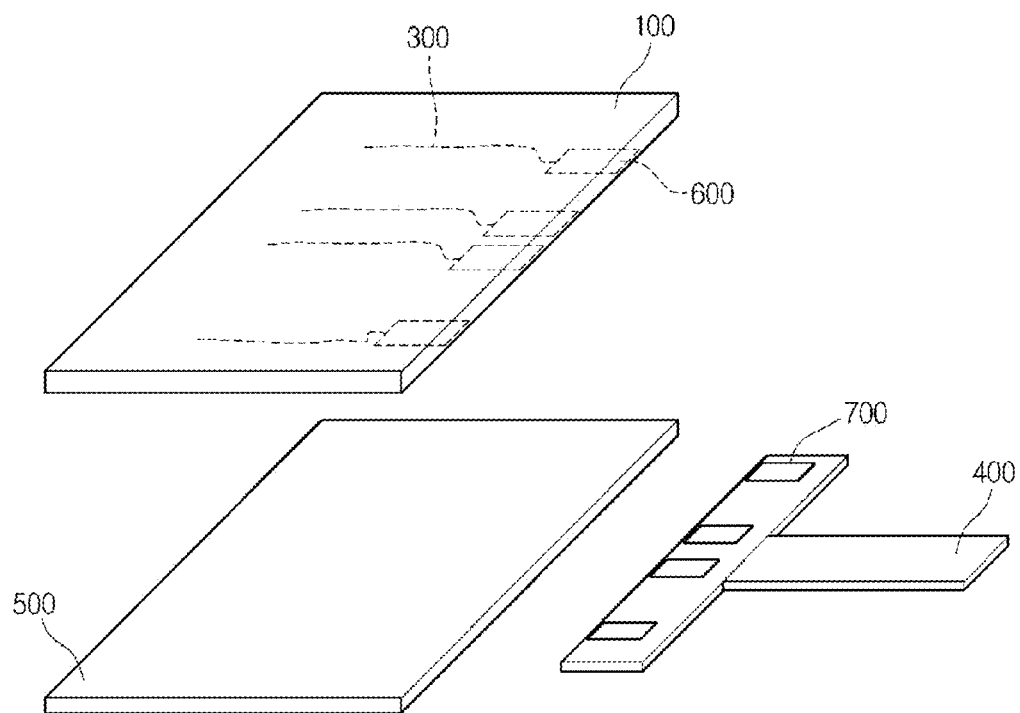


FIG. 12

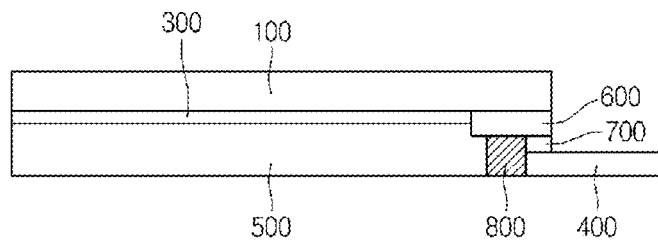


FIG. 13

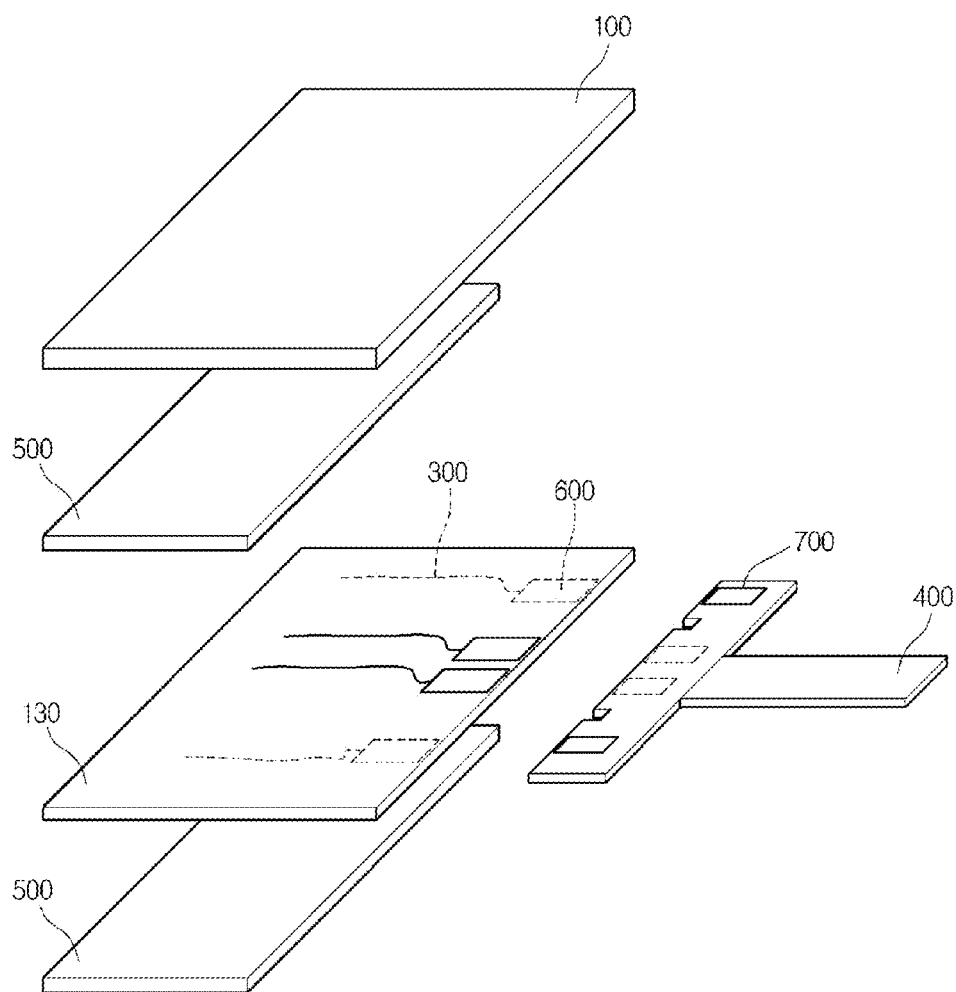
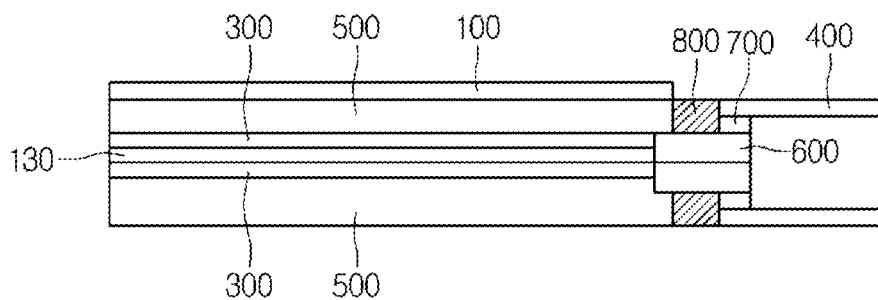


FIG. 14



1

TOUCH WINDOW AND MANUFACTURING METHOD THEREOF

CROSS-REFERENCE TO RELATED APPLICATION

This application claims the benefit under 35 U.S.C. §119 of Korean Patent Application No. 10-2012-0058540, filed May, 31, 2012, which is hereby incorporated by reference in its entirety.

BACKGROUND

A touch window is installed on a display surface of an image display device such as a cathode ray tube (CRT), a liquid crystal display (LCD), a field emission display (FED), a plasma display panel (PDP), and an electro-luminescence device (ELD), so that a user inputs predetermined information into an electronic appliance by pressing the touch panel while viewing the image display device.

FIG. 1 is a view showing a touch window according to the related art.

Referring to FIG. 1, the touch window includes a cover window **100** which receives a touch input from an outside, a TSP (Touch Screen Panel) including an AA (Active Area) for receiving the touch input through a sensing electrode and an UA (Unactive Area) for non-receiving the touch input which are implemented by forming an electrode pattern on a lower portion of the cover window, and an F/A (Function Area) of the cover window **100**, which includes an instruction icon and is electrically connected to the TSP.

The wiring electrode part **300**, which is formed corresponding to the sensing electrode part **200** in the AA, and a pad area, which transfers a touch sensing signal from the wiring electrode part **300** to a driving chip, are formed in the UA. Thus, the touch window is coupled through the pad area to an FPCB (Flexible Printed Circuit Board) **400** in which the driving chip is installed.

Referring to the enlarged view of a bonding area depicted in FIG. 1, according to the related art, after processing the pad area and the FPCB **400**, respectively, an ACF (Anisotropic Conductive Film) bonding process is required for coupling the pad area and the FPCB **400** to each other. However, an empty space **110** may be formed at a portion adhesive to the FPCB **400**. If the empty space **110** is formed, a foreign material may be introduced into the empty space **110** or corrosion may be caused, so that the touch window may be out of order.

BRIEF SUMMARY

According to the embodiment, there is provided a touch window including a cover window including an active area and an unactive area; a sensing electrode part on the active area; a wiring electrode part formed on the unactive area and connected to the sensing electrode part; an insulation film on one end of the wiring electrode part; a flexible printed circuit board spaced apart from the insulation film and formed on an opposite end of the wiring electrode part; and a protective layer on the wiring electrode part placed on a space region between the insulation film and the flexible printed circuit board.

Further, according to the embodiment, there is provided a touch window including a cover window including an active area and an unactive area; a sensing electrode part on the active area; a wiring electrode part formed on the unactive area and connected to the sensing electrode part; a pad part on one end of the wiring electrode part; an insulation film on one

2

end of the pad part; a flexible printed circuit board spaced apart from the insulation film and formed on an opposite end of the pad part; and a protective layer on the pad part placed on a space region between the insulation film and the flexible printed circuit board.

The touch window according to the embodiment includes the protective layer formed on an area of the wiring electrode part or the pad part exposed through the space region between the insulation film and the flexible printed circuit board.

Thus, the protective layer including an insulation material, which is capable of protecting the wiring electrode part or the pad part, is coated on the space region to form the insulation layer, so that the insulation layer can protect the wiring electrode part or the pad part.

Therefore, according to the touch window of the embodiment, the wiring electrode part or the pad part, which may be exposed to an outside through the space region, may be protected from oxidation or corrosion, so that the reliability of the touch window may be improved.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a view showing a touch window according to the related art;

FIG. 2 is a plan view showing the top surface of a touch window according to an embodiment;

FIGS. 3 to 6 views showing a bonding part of a PCB of the touch window according to an embodiment; and

FIGS. 7 to 14 are views showing a bonding part of a wiring electrode part and a FPCB in order to illustrate various embodiments of the touch window according to positions at which first and second sensing electrode patterns are formed.

DETAILED DESCRIPTION

Hereinafter, the structure and the operation according to the embodiment will be described in detail with reference to accompanying drawings. In the following description based on the accompanying drawings, the same elements will be assigned with the same reference numerals regardless of drawing numbers, and the repetition in the description of the same elements having the same reference numerals will be omitted in order to avoid redundancy. Although the terms “first” and “second” may be used in the description of various elements, the embodiment is not limited thereto. The terms “first” and “second” are used to distinguish one element from the other elements.

Hereinafter, a touch window according to an embodiment will be described in detail with reference to FIGS. 2 to 6.

FIG. 2 is a plan view showing the top surface of a touch window according to an embodiment. FIGS. 3 to 6 views showing a bonding part of a PCB of the touch window according to an embodiment.

Referring to FIG. 2, the touch window according to the embodiment includes a cover window **100** including an AA (Active Area) and an UA (Unactive Area), an instruction icon pattern part **500**, a sensing electrode part formed on the AA, a wiring electrode part **300** formed on the UA, a PCB **400**, that is, a FPCB (Flexible Printed Circuit Board) connected to the wiring electrode part.

The cover window **100** may include glass or plastic. For example, the cover window **100** may include strengthened glass, half-strengthened glass, soda-lime glass or strengthened plastic.

The cover window **100** may include the AA and the UA. The AA refers to an area through which a touch instruction may be input by a user. To the contrary to the AA, the UA

signifies an area to which the touch instruction is not input because the UA is not activated even if the touch of the user is input thereto.

The sensing electrode part **200** is formed on the AA. The sensing electrode part **200** includes a first sensing electrode pattern formed in a longitudinal direction and a second sensing electrode pattern formed in a horizontal direction. The sensing electrode part **200** is densely formed on a top surface of the AA of the cover window **100**.

The sensing electrode part **200** may include at least one selected from the group consisting of indium tin oxide, indium zinc oxide, copper oxide, carbon nano tube, CNT and Ag nano wire.

The wiring electrode part **300** is formed on the UA. The wiring electrode part **300** is electrically connected to the sensing electrode part **200**. The wiring electrode part **300** may transfer a touch sensing signal from the sensing electrode part **200** to a driving chip mounted on a connector through the FPCB **400**.

The wiring electrode part **300** may be directly or indirectly connected to the FPCB **400**.

For example, the wiring electrode part **300** and the FPCB **400** may be connected to each other through a plurality of pad parts. The pad parts may be formed of a metallic material such as Ag.

That is, after first and second pad parts **600** and **700** are formed on the wiring electrode part **300** and the FPCB **400**, respectively, the wiring electrode part **300** and the FPCB **400** may be connected to each other through an ACF (Anisotropic Conductive Film) process.

Further, the wiring electrode part **300** and the FPCB **400** may be connected to each other through an ACF (Anisotropic Conductive Film) process without any pad parts.

Further, an insulation film **500** may be formed on one end of the wiring electrode part **300**. The insulation film **500** may extend from the sensing electrode part **200** such that the insulation film **500** may be formed on the one end of the wiring electrode part **300**.

A touch window according to a first embodiment may be formed without any pad parts and a touch window according to a second embodiment may include pad part formed therein.

Referring to FIGS. **2** and **3**, the touch window according to the first embodiment includes a cover window **100** including an AA (Active Area) and an UA (Unactive Area), a sensing electrode part **200** formed on the AA, a wiring electrode part **300** connected to the sensing electrode part **200**, an insulation film **500** formed on one end of the wiring electrode part **300**, a FPCB (Flexible Printed Circuit Board) connected to the wiring electrode part spaced apart from the insulation film **500** and formed an opposite end of the wiring electrode part **300**. In addition, a protective layer **800** is formed on the wiring electrode part **300** placed at a space region between the insulation film **500** and the FPCB **400**.

The protective layer **800** may be formed on the wiring electrode part **300** exposed to an outside through the space region EA. In detail, the protective layer **800** may surround the wiring electrode part **300** exposed to an outside through the space region EA. In more detail, the protective layer **800** may make direct contact with the wiring electrode part **300** exposed to an outside through the space region EA.

The protective layer **800** may include an insulation material. In detail, the protective layer **800** may include at least one of PET (polyethylene terephthalate), PC (polycarbonate), PES (polyethersulfone), PI (polyimide) and PMMA (PolyMethylMethaAcrylate).

Thus, the protective layer **800** may protect the wiring electrode part **300** exposed to an outside through the space region

EA from moisture, oxygen or an impact. Therefore, the protective layer **800** may protect the wiring electrode part **300** exposed to an outside through the space region EA from corrosion, oxidation and crack caused by external influence.

Referring to FIGS. **2** and **4**, the touch window according to the second embodiment includes a cover window **100** including an AA (Active Area) and an UA (Unactive Area), a sensing electrode part **200** formed on the AA, a wiring electrode pad **300** connected to the sensing electrode part **200**, a first pad part **600** formed on one end of the wiring electrode part **300**, an insulation film **500** formed on one end of the first pad part **600**, a FPCB (Flexible Printed Circuit Board) **400** spaced apart from the insulation film **500** and formed an opposite end of the first pad part **600**. In addition, a protective layer **800** is formed on the first pad part **500** placed at a space region between the insulation film **500** and the FPCB **400**.

The protective layer **800** may be formed on the first pad part **600** exposed to an outside through the space region EA. In detail, the protective layer **800** may surround the first pad part **600** exposed to an outside through the space region EA. In more detail, the protective layer **800** may make direct contact with the first pad part **600** exposed to an outside through the space region EA.

The protective layer **800** may include an insulation material. In detail, the protective layer **800** may include at least one of PET (polyethylene terephthalate), PC (polycarbonate), PES (polyethersulfone), PT (polyimide) and PMMA (PolyMethylMethaAcrylate).

Thus, the protective layer **800** may protect the first pad part **600** exposed to an outside through the space region EA from moisture, oxygen or an impact. Therefore, the protective layer **800** may protect the first pad part **600** exposed to an outside through the space region EA from corrosion, oxidation and crack caused by external influence.

According to the touch windows of the first and second embodiments, the wiring electrode part **300** or the first pad part **600** exposed to an outside through the space region EA may be protected from external influence.

According to the related art, the space region of the wiring electrode part or the pad part is exposed to an outside, so that the pad part formed of a metallic material may be oxidized with oxygen, corroded with moisture or cracked.

Thus, an insulation material which is capable of protecting the wiring electrode part or the pad part is coated on the space region of the wiring electrode part or the pad part, that is, the exposed region to form an insulation layer, so that the insulation layer performs the function of protecting the wiring electrode part or the pad part by a protective layer.

Therefore, according to the touch window of the embodiment, the wiring electrode part or the pad part, which may be exposed to an outside when connecting the FPCB to the wiring electrode part, may be protected from oxidation, corrosion, or crack, so that the reliability of the touch window may be improved.

Hereinafter, touch windows having various structures according to various embodiments will be described with reference to FIGS. **7** to **14**. FIGS. **7** to **14** are views showing a bonding part of a wiring electrode part and a FPCB in order to illustrate various embodiments of the touch window according to positions at which first and second sensing electrode patterns are formed. Further, the embodiments may be applied to the first and second embodiments.

Referring to FIGS. **7** and **8**, according to the touch window of the embodiment, a first sensing electrode part (not shown) may be formed on one surface of a first substrate **110** disposed

on a cover window **100**. A second sensing electrode part (not shown) may be formed on a second substrate **120** disposed on the first substrate **110**.

A wiring electrode part **300** is formed on a UA (Unactive Area) of the first and second substrates **110** and **120**. A first pad part **600** for connecting a FPCB **400** to the wiring electrode part **300** is formed on the first and second substrates **110** and **120**. The first pad part **600** may be adhesive to the second pad part **700** formed on the FPCB **400** through an ACF bonding. As described above, the wiring electrode part **300** may be directly connected to the FPCB **400** without any pad parts.

Further, an insulation film **500** may be disposed between the cover window **100** and the first substrate **110** and between the first and second substrates **110** and **120**. The insulation film **500** may protect sensing electrodes formed on an AA (Active Area) of the first and second substrate **110** and **120**. The insulation film **500** may be formed to make contact with one end of the wiring electrode part **300** or one end of the first pad part **600**.

Further, the FPCB **400** is spaced apart from the insulation film **500** to form a space region. The FPCB **400** may be formed to make contact with the opposite end of the wiring electrode part **300** or the opposite end of the first pad part **600**. That is, the second pad part **700** may be formed to make contact with the opposite end of the wiring electrode part **300** or the opposite end of the first pad part **600**.

A protective layer **800** is formed by coating an insulation material on the space region. In detail, the protective layer **800** may be formed while making direct contact with the wiring electrode part or the first pad part or directly surrounding the wiring electrode part or the first pad part which is exposed to an outside through the space region.

Referring to FIGS. **9** and **10**, according to the touch window of the embodiment, a first sensing electrode part (not shown) may be formed on one surface of the cover window **100**. A second sensing electrode part (not shown) may be formed on one surface of a substrate disposed on the cover window **100**.

A wiring electrode part **300** is formed on a UA (Unactive Area) of the cover window **100** and a first substrate **110**. A first pad part **600** for connecting a FPCB **400** to the wiring electrode part **300** is formed on the cover window **100** and the first substrate **110**. The first pad part **600** may be adhesive to the second pad part **700** formed on the FPCB **400** through an ACF bonding. As described above, the wiring electrode part **300** may be directly connected to the FPCB **400** without any pad parts.

Further, an insulation film **500** may be disposed between the cover window **100** and the first substrate **110**. The insulation film **500** may protect sensing electrodes formed on an AA (Active Area) of the cover window **100** and the first substrate **110**. The insulation film **500** may be formed to make contact with one end of the wiring electrode part **300** or one end of the first pad part **600**.

Further, the FPCB **400** is spaced apart from the insulation film **500** to form a space region. The FPCB **400** may be formed to make contact with the opposite end of the wiring electrode part **300** or the opposite end of the first pad part **600**. That is, the second pad part **700** may be formed to make contact with the opposite end of the wiring electrode part **300** or the opposite end of the first pad part **600**.

A protective layer **800** is formed by coating an insulation material on the space region. In detail, the protective layer **800** may be formed while making direct contact with the wiring electrode part or the first pad part or directly surrounding the wiring electrode part or the first pad part which is exposed to an outside through the space region.

Referring to FIGS. **11** and **12**, according to the touch window of the embodiment, first and second sensing electrode parts (not shown) may be formed on a cover window **100**. That is, the first and second sensing electrode parts may be formed on one surface of the cover window **100**.

A wiring electrode part **300** is formed on a UA (Unactive Area) of the cover window **100**. A first pad part **600** for connecting a FPCB **400** to the wiring electrode part **300** is formed on the cover window **100**. The first pad part **600** may be adhesive to the second pad part **700** formed on the FPCB **400** through an ACF bonding. As described above, the wiring electrode part **300** may be directly connected to the FPCB **400** without the first pad part **600**.

Further, an insulation film **500** may be formed on a lower surface of the cover window **100**, that is, one surface of the cover window **100** on which the sensing electrode part. The insulation film **500** may protect sensing electrodes formed on an AA (Active Area) of the cover window **100**. The insulation film **500** may be formed to make contact with one end of the wiring electrode part **300** or one end of the first pad part **600**.

Further, the FPCB **400** is spaced apart from the insulation film **500** to form a space region. The FPCB **400** may be formed to make contact with the opposite end of the wiring electrode part **300** or the opposite end of the first pad part **600**. That is, the second pad part **700** may be formed to make contact with the opposite end of the wiring electrode part **300** or the opposite end of the first pad part **600**.

A protective layer **800** is formed by coating an insulation material on the space region. In detail, the protective layer **800** may be formed while making direct contact with the wiring electrode part or the first pad part or directly surround the wiring electrode part or the first pad part which is exposed to an outside through the space region.

Referring to FIGS. **13** and **14**, according to the touch window of the embodiment, first and second sensing electrode parts (not shown) may be formed on both surfaces of a substrate **130** disposed on a cover window **100**. That is, the first and second sensing electrode parts may be formed on both surfaces of the substrate **130**.

A wiring electrode part **300** is formed on a UA (Unactive Area) of the substrate **130**. A first pad part **600** for connecting a FPCB **400** to the wiring electrode part **300** is formed on the substrate **130**. The first pad part **600** may be adhesive to the second pad part **700** formed on the FPCB **400** through an ACF bonding. As described above, the wiring electrode part **300** may be directly connected to the FPCB **400** without the first pad part **600**.

Further, an insulation film **500** may be disposed between the cover window **100** and the substrate **130** and on a lower surface of the substrate **130**. The insulation film **500** may protect sensing electrodes formed on an AA (Active Area) of the substrate **130**. The insulation film **500** may be formed to make contact with one end of the wiring electrode part **300** or one end of the first pad part **600**.

Further, the FPCB **400** is spaced apart from the insulation film **500** to form a space Region. The FPCB **400** may be formed to make contact with the opposite end of the wiring electrode part **300** or the opposite end of the first pad part **600**. That is, the second pad part **700** may be formed to make contact with the opposite end of the wiring electrode part **300** or the opposite end of the first pad part **600**.

A protective layer **800** is formed by coating an insulation material on the space region. In detail, the protective layer **800** may be formed while making direct contact with the wiring electrode part or the first pad part or directly surrounding the wiring electrode part or the first pad part which is exposed to an outside through the space region.

As described above, according to the touch window of the embodiment, the protective layer including an insulation material is formed on the space region of the wiring electrode part or the pad part, that is, the exposed region.

Thus, the insulation layer is formed by coating an insulation material, which is capable of protecting the wiring electrode part or the pad part, on the space region of the wiring electrode part or the pad part, so that the insulation layer can perform the function of the protective layer of protecting the pad part.

Therefore, according to the touch window of the embodiment, the wiring electrode part or the pad part, which may be exposed to an outside through the space region, may be protected by the protective layer, so that the wiring electrode part or the pad part may be protected from oxidation or corrosion, so the reliability of the touch window may be improved.

Although the exemplary embodiments of the present invention have been described, it is understood that the present invention should not be limited to these exemplary embodiments but various changes and modifications can be made by one ordinary skilled in the art within the spirit and scope of the present invention as hereinafter claimed.

What is claimed is:

1. A touch window comprising:
 - a cover window including an active area and an unactive area;
 - a sensing electrode part on the active area;
 - a wiring electrode part formed on the unactive area and connected to the sensing electrode part;
 - a pad part on one end of the wiring electrode part;
 - an insulation film on one end of the pad part;
 - a flexible printed circuit board spaced apart from the insulation film and formed on an opposite end of the pad part; and
 - a protective layer on the pad part placed on a space region between the insulation film and the flexible printed circuit board;
 wherein the pad part includes a first pad portion in contact with and covered by the flexible printed circuit board, and a second pad portion separated from and exposed from the flexible printed circuit board; and
2. The touch window of claim 1, wherein the protective layer surrounds the pad part.
3. The touch window of claim 2, wherein the protective layer makes direct contact with the pad part.
4. The touch window of claim 1, wherein the protective layer comprises an insulation material.
5. The touch window of claim 4, wherein the insulation material comprises at least one of PET (polyethylene terephthalate), PC (polycarbonate), PES (polyethersulfone), PI (polyimide) and PMMA (polymethylmethacrylate).
6. The touch window of claim 1, wherein the sensing electrode part comprises:
 - a first sensing electrode pattern and a second sensing electrode pattern on one surface of the cover window.

7. The touch window of claim 6, wherein the wiring electrode part and the pad part are formed on the unactive area of the cover window.

8. The touch window of claim 1, wherein the sensing electrode part comprises:

- a first sensing electrode pattern on one surface of the cover window; and
- a second sensing electrode pattern on one surface of a first substrate on the cover window.

9. The touch window of claim 8, wherein the wiring electrode part and the pad part are formed on the unactive areas of the cover window and the first substrate.

10. The touch window of claim 1, wherein the sensing electrode part comprises:

- a first sensing electrode pattern on one surface of a first substrate on the cover window; and
- a second sensing electrode pattern on one surface of a second substrate on the first substrate.

11. The touch window of claim 10, wherein the wiring electrode part and the pad part are formed on the first and second substrates.

12. The touch window of claim 1, wherein the sensing electrode part comprises:

- a first sensing electrode pattern on one surface of a substrate on the cover window; and
- a second sensing electrode pattern on an opposite surface of the substrate.

13. The touch window of claim 12, wherein the wiring electrode part and the pad part are formed on both surfaces of the substrate.

14. A touch window comprising:

- a cover window including an active area and an unactive area;
- a sensing electrode part on the active area;
- a wiring electrode part formed on the unactive area and connected to the sensing electrode part;
- an insulation film on one end of the wiring electrode part;
- a flexible printed circuit board spaced apart from the insulation film and formed on an opposite end of the wiring electrode part;
- a protective layer placed on a space region between the insulation film and the flexible printed circuit board; and
- a pad portion on the wiring electrode part and in contact with and covered by the flexible printed circuit board; wherein the wiring electrode part is separated from and exposed from the flexible printed circuit board, and wherein the protective layer is disposed on the wiring electrode part.

15. The touch window of claim 14, wherein the protective layer surrounds the wiring electrode part.

16. The touch window of claim 15, wherein the protective layer makes direct contact with the wiring electrode part.

17. The touch window of claim 14, wherein the protective layer comprises an insulation material.

18. The touch window of claim 17, wherein the insulation material comprises at least one of PET (polyethylene terephthalate), PC (polycarbonate), PES (polyethersulfone), PI (polyimide) and PMMA (polymethylmethacrylate).

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